PATENT APPLICATION
DOCKET NO. 10007804-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Huei Pei Kuo, et. al.
SERIAL NO.:	10/656,635
FILED:	September 4, 2003
FOR:	ANODIZING PROCESS FOR IMPROVING ELECTRONIC EMISSION IN ELECTRONIC DEVICES
ART UNIT:	2811
EXAMINER:	Hu, Shouxiang.
DOCKET NO.:	10007804-1

CERTIFICATE OF DEPOSIT UNDER 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail, postage prepaid, under 37 C.F.R. § 1.8 on the date indicated below and is addressed to Commissioner for Patents, Alexandria, VA 22313-1450.

Name

May 19 05
Date of Deposit

DECLARATION OF HUEI PEI KUO UNDER 37 C.F.R. § 1.131

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I, Huei Pei Kuo declare as follows:

1. I am a named inventor in the above-captioned application and the subject matter described and claimed therein.

2. It is my understanding that various claims in the above-recited patent application have been rejected in view of United States Patent Application Publication 2003/0143788 A1, filed

January 31, 2002, and entitled "Method of Manufacturing an Emitter."

3. The invention as described and claimed in the above-referenced United States Patent Application Serial Number 10/656,635 was conceived and reduced to practice prior to January 31, 2002. I participated in the development of the claimed fabrication methods and electron emission devices and contributed to the disclosures which were subsequently used in preparation of the above-referenced patent application. Exhibit 1 contains a redacted version of the invention disclosures documenting the conception of the invention, which I prepared and had witnessed prior to January 31, 2002.

5. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful, false statement may jeopardize the validity of the application or any patent issuing thereon.

DATED this 18 day of May, 2005.

Huei-Pei Kuo, Inventor of the Invention

EXHIBIT 1

IAL-PA

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HEWLETT PACKARD **INVENTION DISCLOSURE**

PAGE ONE OF 4

PDNO 10007804 DATE RCVD 10/14/00 ATTORNEY THO

*Instructions: The information contained in this document is **COMPANY CONFIDENTIAL** and may not be disclosed to others without prior authorization. Submit this disclosure to the HP Legal Department as soon as possible. No patent protection is possible until a patent application is authorized, prepared, and submitted to the Government.*

Descriptive Title of Invention:
Metal Mask for Anodization

Name of Project:
ARS

Product Name or Number:

Was a description of the invention published, or are you planning to publish? If so, the date(s) and publication(s):

Was a product including the invention announced, offered for sale, sold, or is such activity proposed? If so, the date(s) and location(s):

Was the invention disclosed to anyone outside of HP, or will such disclosure occur? If so, the date(s) and name(s):

If any of the above situations will occur within 3 months, call your IP attorney or the Legal Department now at 1-898-4919 or 970-898-4919.

Was the invention described in a lab book or other record? If so, please identify (lab book #, etc.)

Was the invention built or tested? If so, the date:

Was this invention made under a government contract? If so, the agency and contract number:

Description of Invention: *Please preserve all records of the invention and attach additional pages for the following. Each additional page should be signed and dated by the inventor(s) and witness(es).*

A. Prior solutions and their disadvantages (if available, attach copies of product literature, technical articles, patents, etc.).
B. Problems solved by the invention.
C. Advantages of the invention over what has been done before.
D. Description of the construction and operation of the invention (include appropriate schematic, block, & timing diagrams; drawings; samples; graphs; flowcharts; computer listings; test results; etc.)

Signature of Inventor(s): Pursuant to my (our) employment agreement, I (we) submit this disclosure on this date: [ ].

Employee No.	Name	Signature	Telnet	Mailstop	Entity & Lab Name
15611	Hwei Pei Kuo	Hwei Pei Kuo	857-5407	241-18	HPL
530440	Xia Sheng				HPLJ

(If more than four inventors, include additional information on another copy of this form and attach to this document)

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HEWLETT PACKARD **INVENTION DISCLOSURE** COMPANY CONFIDENTIAL PAGE 2 OF 4

Signature of Witness(es): *(Please try to obtain the signature of the person(s) to whom invention was first disclosed.)*

The invention was first explained to, and understood by, me (us) on this date: [ ]

Full Name	Signature	Date of Signature
STEVEN LOUIS NABERHUIS	Steven L. Naberhuis	Oct. 16, 2000
Full Name	Signature	Date of Signature

Inventor & Home Address Information: *(If more than four inventors, include addl. information on a copy of this form & attach to this document)*

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Description of Invention: *Please preserve all records of the invention and attach additional pages for the following. Each additional page should be signed and dated by the inventor(s) and witness(es).*

A. Prior solutions and their disadvantages (if available, attach copies of product literature, technical articles, patents, etc.).

As dielectric layer is used to delineate the regions to be anodized in porous silicon emitters. ~~As shown~~. The electric field is intensified at the boundry of the dielectric mask. This cause the anodization process to accelerate along the boundary of the mask and causes non-uniform anodization

B. Problems solved by the invention.

The non uniform anodization is minimized when a metallic or conductive material, e.g., chrome, gold, platinum, is used as the anodization mask.

C. Advantages of the invention over what has been done before.

A more uniform anodization and improved electron emission from the anodized area.

D. Description of the construction and operation of the invention (include appropriate schematic, block, & timing diagrams; drawings; samples; graphs; flowcharts; computer listings; test results; etc.)

To achieve anodization of porous silicon emitters, a metallic mask is used to delineate the intended region to be anodized

The field distribution is depicted in the attached diagram.

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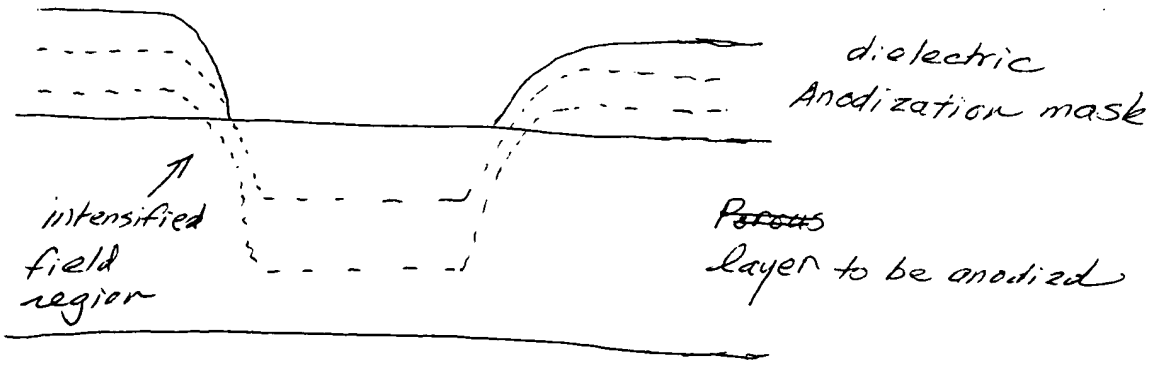
Dielectric mask causes electric field to be intensified at the bondary of mask

CATHODE



n^{++}

Substrate

ANODE

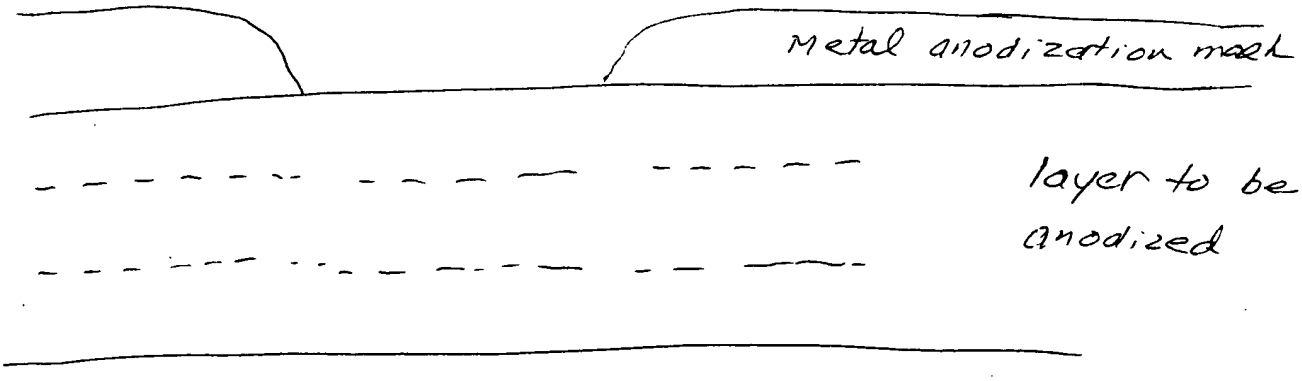
+

----- dashed lines indicating equipotential surfaces

Metal Mask / conductive mask

no intensified electric fied at boundary of mask

HF



F A C S I M I L E

TO:		FROM:	
Name:	Keith	Name:	Huei Rei Kuo
Fax #:	(801) 566-6673	Fax #:	(650) 852 8579
Pages:		Date/Time:	9/5/01

MESSAGE:

Keith:

This is something we would like to add to the patent

HP FAX

received 9-5-01 V.M.

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Description of Invention: *Please preserve all records of the invention and attach additional pages for the following. Each additional page should be signed and dated by the inventor(s) and witness(es).*

A. Prior solutions and their disadvantages (if available, attach copies of product literature, technical articles, patents, etc.).

Electron sources from flat emission surfaces are used for various applications. A patterned dielectric layer is formed on top of the electron source to confine the electron emission to specific regions where no dielectric layer is present. The boundary lines of the dielectric layer, however, tend to have a higher electric field. This causes the electron source to emit preferentially along the border of the emission area and causes device failure along the borders.

B. Problems solved by the invention.

The high field concentration along the border of the electron emission regions is eliminated.

C. Advantages of the invention over what has been done before.

The elimination of the higher field improves the uniformity of the electron emission and improved the life time and stability of electron emission.

D. Description of the construction and operation of the invention (include appropriate schematic, block, & timing diagrams; drawings; samples; graphs; flowcharts; computer listings; test results; etc.)

The fabrication process of the electron source is depicted in the following figures.

In prior art the following three steps are used to define the emission area.

Figure 1P. A thin layer of polycrystalline silicon is grown on top of single crystalline silicon.

Figure 2P. Prior Art. A layer of dielectric material, e.g. SiO2 or Si3N4, is grown or deposited.

Figure 3P. Prior art. The dielectric layer is patterned to define the emission area.

In the present invention, the following steps are used.

Figure 1I. A layer of dielectric material, e.g. SiO2 or Si3N4, is grown or deposited.

Figure 2I. The dielectric layer is patterned to define the emission area.

Figure 3I. A thin layer of polycrystalline silicon is grown on top of the single crystalline silicon and the dielectric.

In both the prior art and the present invention

Figure 4. Dielectric layer grown over the structure. When the thermal oxidation is used for this step, a high field along the boarder for the devices is produced with the prior art. The high field is eliminated with the present invention.

Prior Art

Fig 1P

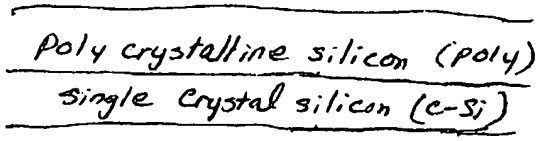


Fig 2P

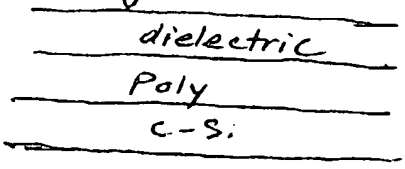
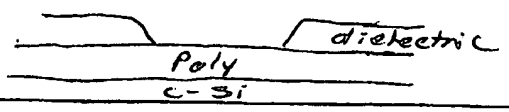


Fig 3P



Present Invention

Fig 1I

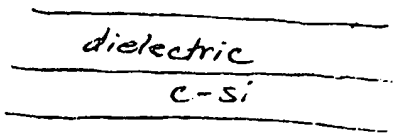


Fig 2I

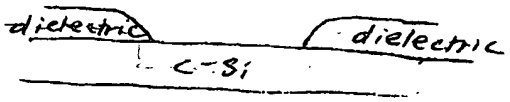


Fig 3I